

CLAIMS

What is claimed is:

1. A switching apparatus for switching first and second voltages to a function circuit in at least one integrated circuit die having at least one external communication terminal, the at least one integrated circuit die being provided in a module having a module terminal for receiving the first voltage from circuitry external to the module, the switching apparatus comprising:

a switching circuit connected to the at least one external communication terminal between the module terminal and the function circuit to selectively isolate the function circuit from the module terminal and to conduct the first voltage to the function circuit, the switching circuit comprising a programmable circuit for isolating the function circuit, the programmable circuit including at least one programmable element; and
an impedance circuit to conduct the second voltage to the function circuit upon isolation of the function circuit from the module terminal and to support a voltage differential between the first voltage at the function circuit and the second voltage.

2. The apparatus of claim 1, wherein the programmable circuit includes a programmable element selected from a group comprising a metal fuse, a polysilicon fuse, and a flash memory cell.

3. The apparatus of claim 2, wherein the programmable element is interposed between one of the function circuit, the module terminal, and the at least one external communication terminal.

4. The apparatus of claim 1, wherein the switching circuit comprises a switchable element selected from a group comprising an NMOS transistor and a PMOS transistor.

5. The apparatus of claim 1, wherein the at least one integrated circuit die includes the switching circuit connected between the at least one external communication terminal and the function circuit.

6. The apparatus of claim 1, wherein the module includes a substrate having the at least one integrated circuit die attached thereto, the substrate including the switching circuit connected between the module terminal and the at least one external communication terminal.

7. An integrated circuit die comprising:
a die connection terminal to receive a first mode initiating signal from circuitry external to the integrated circuit die;
a function circuit responsive to the first mode initiating signal by entering a first mode and responsive to a second mode initiating signal by entering a second mode;
a switching circuit connected between the die connection terminal and the function circuit to selectively isolate the function circuit from the die connection terminal and to conduct the first mode initiating signal to the function circuit, the switching circuit comprising a programmable circuit including at least one switching circuit selected from a group comprising a fuse, a transistor, and a flash memory cell; and
an impedance circuit connected to the function circuit to conduct the second mode initiating signal to the function circuit upon the function circuit being isolated from the die connection terminal and to support a voltage differential between the first mode initiating signal at the function circuit and the second mode initiating signal.

8. An integrated circuit module comprising:
a first terminal and a second terminal for receiving a first voltage and a second voltage respectively from circuitry external to the integrated circuit module;
a plurality of integrated circuit dice, each integrated circuit die including:
an external communication terminal;

a function circuit coupled to the external communication terminal responsive to the first voltage by entering a first mode and responsive to the second voltage by entering a second mode, the second mode being different than the first mode; and
a switching apparatus connected between the first terminal and the external communication terminal of each integrated circuit die of the plurality of integrated circuit dice to selectively isolate the function circuit from the first terminal and to conduct the first voltage to the function circuit, the switching apparatus comprising a programmable circuit including a programmable element consisting of a fuse, a transistor, and a flash memory cell; and
an impedance apparatus connected between the second terminal and the external communication terminal of each integrated circuit die of the plurality of integrated circuit dice to conduct the second voltage to the function circuit upon isolating the function circuit from the first terminal and to support a voltage differential between the first voltage at the function circuit and the second voltage at the second terminal.

9. A method for initiating at least a first mode and at least a second mode in a function circuit in each circuit die of one or more integrated circuit dice in an integrated circuit module having a module terminal, the function circuit being of the type to enter the at least a first mode and the at least a second mode in response to receiving respectively a first mode initiate signal and a second mode initiate signal, each integrated circuit die including one or more bond pads connected to circuits for receiving a test mode initiate signal at the module terminal, the method comprising:
conducting the first mode initiate signal to external communication terminals for receiving the first mode initiate signal and from the external communication terminals to the function circuit for initiating the at least a first mode therein, said conducting the first mode initiate signal at least including connecting the module terminal to the function circuit through one of the external communication terminals for receiving the first mode initiate signal;

discontinuing conducting the first mode initiate signal to the function circuit using an element;
and
conducting the second mode initiate signal to the function circuit for initiating the at least a
second mode therein.

10. The method of claim 9, wherein conducting the first mode initiate signal comprises:
connecting and disconnecting the module terminal to and from the function circuit through one
of the external communication terminals for receiving the first mode initiate signal; and
supporting a difference in voltages between the first mode initiate signal at the function circuit
and the second mode initiate signal.

11. The method of claim 10, wherein disconnecting conducting of the first mode
initiate signal to the function circuit comprises disconnecting the function circuit from the
module terminal.

12. The method of claim 11, wherein disconnecting the function circuit from the
module terminal comprises programming a programmable element selected from a group
comprising a fuse, an anti-fuse, and a flash memory cell.